SEISMIC SAFETY

beverly hills general plan

8-75

Note: On March 7, 1975, by Resolution No. 75-R-5326, the Beverly Hills City Council adopted pages 1 through 26 of this document.

SEISMIC SAFETY ELEMENT ABSTRACT

1. Impetus: State requirement.

2. Existing Situation.

2.1. At least two fault lines are in Beverly Hills: the Santa Monica Fault, which traverses the entire City about 300 yards south of Santa Monica Boulevard, and the Newport-Inglewood Fault, a fissure which enters the southern portion of Beverly Hills.[1/]

2.2. Most of the City (all land south of Sunset Boulevard) is in alluvium, the most unstable geologic soil type in this region.

2.3. Some has been "filled" and landslides are possible.

3. Existing Policies: None.

4. Problems: Possible loss of life and/or damage to property because of:

4.1. Fault movement.
4.2. Ground shaking.
4.3. Liquefaction.

5. Proposed Solutions.[2/]

5.1. Adopt Standards on Acceptable Levels of

5.1.1. Risk.
5.1.2. Aseismic construction.

5.2. Review Optimal Land Use Considerations.

5.3. Develop a Strategy, including a program to remove or upgrade structures below a certain aseismic level.

6. Environmental Impact (i.e., impacts if <u>Element</u> were implemented). An <u>EIR</u> was developed that concluded that there would be no significant impacts. (There could be significant ones pursuant to the proposed development of a strategy.)

Beverly Hills. Dept of pl

City pl. Beverly Hills

Emerg. relief Earthquakes"

1/ The precise alignment of the faults is now being mapped by the State and U.S.G.S.

2/ As with any specialized study, the recommendations must be considered in terms of their priorities relative to other municipal projects competing for the City's attention and financial resources.

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1. INTRODUCTION.

1.1. Purposes of Element.

This document is one of the nine State-required elements that must be included in the General Plan. It is supposed to serve as a guide to minimize damage to property, bodily injury or death, or other adverse impacts that could result from seismic activity.

The document follows the format suggested by the State and is intended to fulfill the requirements of the State law.

Prior to 1933, development decisions were made without concern to seismic factors. Even after that date, many decisions were made without adequate seismic input or without the aid of modern technology. This Element is designed to provide additional data to assist members of the City Council, City Commissions, staff, and the general public to evaluate matters related to seismic activity by establishing a policy and direction regarding seismic matters that is appropriate to Beverly Hills.

A glossary of seismic terms appears in Section 4. A description of the Richter Scale and illustrations of types of fault movements are included in the Appendices.

1.2. Objectives of Element.

- To summarize seismic data related specifically to Beverly Hills so as to develop a body of information for use by the 1) City's decision makers and citizens as appropriate, and 2) by the citizens in lessening the potential impacts of seismic activities.
- To strive to create methods to ensure that structures for human occupancy -- especially critical structures (hospitals, police and fire departments) -- are designed to minimize potential damage from seismic activity.
- To serve as one input in determining future land use patterns of Beverly Hills.
- To verify that the City's emergency communications network remains functional after major seismic activity.

2. PLAN.

2.1. Existing Situation.

The location of faults and geologic formations in and near Beverly Hills is noted and discussed in Section 3. of this document. Data in this Section confirms the already-known conclusion that there is a significant chance that Beverly Hills would be affected by seismic activity in the future.

2.2. Existing Policies.

The City has no official policy related to seismic activity. However, the Beverly Hills Department of Building & Safety does enforce most of the earthquake-related regulations of the Uniform Building Code (Section 2314 of the Code).* (This Section has been reproduced in Appendix B.)

Beverly Hills deviates from this Code in one significant way: the lateral force required by the Uniform Building Code for medium and/or high rise structures is one times the deadload; in Beverly Hills the requirement has been increased by the Department of Building & Safety to 1.5 times the deadload. This change was done to insure a stronger, more seismic resistant building.

2.3. Standards.

The Joint Committee on Seismic Safety of the California Legislature has recommended a scale of acceptable risk and this is included on Table 1.

Construction standards are included in the Uniform Building Code. (See Section 2.2. and Appendix B.) Aseismic (anti-earthquake impact) construction standards originally came into use in Southern California after the 1933 Long Beach Earthquake; and as new technology and construction methods have been developed, they have been updated and altered frequently.

2.4. Enumeration of Problems.

The seismic problems are enumerated and discussed in Section 3. and include the following: Probable loss of life and/or damage to property because of:

- Fault movement;

* The 1970 Uniform Building Code was adopted by the City as Ordinance No. 71-0-1405 (with certain modifications). The 1973 edition of the Code (latest edition) has not yet been adopted; currently, the Department of Building & Safety is reviewing this newer edition in preparation of adoption.

TABLE 1

A Scale of Acceptable Risks

Importance Factor	Level of Acceptable Risk		Extra Project Cost Probably Required to Reduce Risk to an Acceptable Level
1	Extremely Low 1/	Structures whose continued functioning is critical, or whose failure might be catastrophic: nuclear reactors, large dams, power intertie systems, plants manufacturing or storing explosives or toxic materials, freeway interchange structures and large toll bridges.	No set percentage (whatever is required for maximum attainable safety)
2	Slightly higher than under level 1	Structures whose use is critically needed after a disaster: important utility centers; hospitals; fire, police, and emergency communication facilities; fire stations; and critical transportation elements such as bridges and overpasses; also smaller dams.	5 to 25 percent of project cost 2/
3	Lowest possible risk to occupants of the structure 3/	Structures of high occupancy, or whose use after a disaster would be particularly convenient: schools, churches, theaters, large hotels, and other high-rise buildings housing large numbers of people, other places normally attracting large concentrations of people, civic buildings, secondary utility structures, extremely large commercial enterprises, most roads, alternative or noncritical bridges and overpasses.	5 to 15 percent of project cost 4/
4	An "ordinary" level of risk to occupants to the structure	The vast majority of structures: most commercial and industrial buildings, small hotels and apartment buildings, and single family residences.	1 to 2 percent of project cost, in most cases (2 to 10 percent of project cost in a minority of cases) 5/

Source: Meeting the Earthquake Challenge, Final Report to the Legislature, State of California, by the Joint Committee on Seismic Safety, January, 1974. Part One: A Comprehensive Approach to Seismic Safety, p. 9.

N.B. Not all "Types of Structures" are applicable to Beverly Hills development patterns.

1/ Failure of a single structure may affect substantial populations.
2/ These additional percentages are based on the assumption that the base cost is the total cost of the building or other facility when ready for occupancy. In addition, it is assumed that the structure would have been designed and built in accordance with current codes. Moreover, the estimated additional cost presumes that structures in this acceptable-risk category are to embody sufficient safety to remain functional following an earthquake.
3/ Failure of a single structure would affect primarily only the occupants.
4/ These additional percentages are based on the assumption that the base cost is the total cost of the building or facility when ready for occupancy. In addition, it is assumed that the structures would have been designed and built in accordance with current codes. Moreover, the estimated additional cost presumes that structures in this acceptable-risk category are to be sufficiently safe to give reasonable assurance of preventing injury or loss of life during an earthquake, but otherwise not necessarily to remain functional.
5/ "Ordinary risk": Resist minor earthquakes without damage; resist moderate earthquakes without structural damage, but with some non-structural damage; resist major earthquakes of the intensity or severity of the strongest experienced in California, without collapse, but with some structural as well as non-structural damage. In most structures, it is expected that structural damage, even in a major earthquake, could be limited to repairable damage. (Structural Engineers Association of California)

- Ground shaking associated with seismic activity. The probability of significant adverse impact is increased because most of the geologic foundation (i.e., soil) of the City is of alluvium -- the least stable type found in the Los Angeles Region; and

- Liquefaction associated with seismic activity. The groundwater level in many portions of Beverly Hills is relatively high; especially because of the alluvium, the probability of liquefaction is increased, thus causing a significant adverse impact.

2.5. Policies, Programs to Mitigate Seismic Problems.

This section proposes a strategy which addresses the major issues and which recognizes practical limitations by which excessive seismic concerns could be mitigated in Beverly Hills. As with any specialized study, the recommendations must be considered in terms of their priority relative to other municipal projects competing for the City's attention and financial resources.

2.5.1. Map Precise Location, Width of Santa Monica Fault.

The precise location of the Santa Monica Fault in Beverly Hills -- including its actual width and the minimum area that is likely to be directly affected by fault movement -- is now being mapped by the State Division of Mines and Geology and the U.S. Geologic Survey. The study will be completed in June, 1976. Data from it would enable staff to locate the minimum area which would be directly affected by the Fault if seismic activity occurred in Beverly Hills or along the Santa Monica Fault, and the information would be useful in undertaking the following steps.

2.5.2. Adopt Standards.

2.5.2.1. On Acceptable Levels of Risk.

Upon completion of precise mapping, the City should evaluate the costs associated with construction in accordance with various levels of risk in order to determine levels of acceptable risk and then adopt standards pursuant to acceptable levels of risk. These should be incorporated into the Municipal Code and enforced in both existing and proposed construction. In addition to the format cited in Table 1 of this document, consideration should be given to developing different standards pursuant to proximity to the Fault: Structures on or near the Fault might be required to have more stringent standards than those further distant from it. This procedure might result in the division of Beverly Hills into several areas relative to land uses and distances from the Fault; and this could be mapped and treated in a similar manner as the City's setback map.

2.5.2.2. On Acceptable Levels of Aseismic Construction.

The Department of Building & Safety should propose a set of acceptable aseismic construction standards. (It is probable that the existing criteria are satisfactory. See Section 2.2. and Appendix B.)

2.5.3. Review Optimal Land Use Considerations.

Consideration should be given to seismic factors by the Department of City Planning when preparing a land use plan so as to recommend development types which would minimize potential loss to life and property. Although of limited value for existing construction, it may be advisable to consider as an optimum condition for new construction that no structures be allowed on the Fault, and structures within one-eighth mile of it should not be regularly occupied by people unless of at certain aseismic construction level. (This could become mandatory along the Santa Monica Fault pursuant to the Alquist-Priolo Bill.)

Such a standard may well be impractical or undesirable for Beverly Hills, even though it might be optimum relative to seismic factors. As the Map shows, if implemented, much of the Business Triangle would be affected, and approximately 3,350 dwelling units would be included in this area. (See Table 2.) Therefore, the City's financial structure would be impacted severely.

The costs to the City to implement the ideal proposal of removing all structures from the quarter mile limit would be staggering; and the City could probably not afford to undertake the project, even if it were desirable. At a minimum, there would be costs to the City for land acquisition, structure demolition, and relocation.

Given the impracticality of removing development of the half-mile wide "fault strip" which geologists feel is optimal, the contents of Section 2.5.2. becomes especially significant for Beverly Hills: it proposes that acceptable levels of risk be structured not only relative to land use and activity but also pursuant to distance from the Fault.

Certain land use inputs may be possible, however. For example, it might be feasible to remove construction now atop the Fault line. The California Division of Mines and Geology estimates that the width of the Santa Monica Fault through Beverly Hills is about 100 feet. If the City chose to prohibit all structures atop the Fault, a strip wider than 100 feet would have to be developed. Table 2 illustrates an estimate of the number of residential units that would be demolished.

2.5.4. Development of Strategy.

The City should then develop a practical, realistic strategy which would lessen the chances of seismic problems in Beverly Hills. The specific goals of this would be to 1) bring construction quality up to a certain aseismic level, 2) consider removal of structures upon the Santa Monica Fault, and 3) be harmonious with the City's adopted disaster plan.

TABLE 2

Estimate of Number of Units and Number of Structures

Within One-Eighth Mile of the Santa Monica Fault in Beverly Hills

Subarea	Type of Unit	Number of Structures	Number of Units	Average Number of People/ Dwelling Unit[a]	Estimate of Total Number of People Displaced[b]
South of Santa Monica Boulevard, north of Burton Way, east of Alpine Drive	Single family detached	6	6		10.9
	Multi-family[c]	85	1,434	1.82	2,609.9
South of Burton Way, east of Crescent Drive	Single family detached	63	63		114.7
	Multi-family[c]	5	123	1.82	223.9
South of Wilshire Boulevard, east of Spalding Drive	Single family detached	30	30		63.3
	Multi-family[c]	50	388	2.11	818.7
South of Santa Monica Boulevard, west of Spalding Drive	Single family detached	0	0		0
	Multi-family[c]	94	1,297	2.11	2,736.7
TOTAL		333	3,347	N.R.	6,578.1

Source: Beverly Hills Department of City Planning, May, 1975.
N.B. Includes units only partially within "strip."
N.R. Not relevant.

a/ Source: 1970 U.S. Census of Population. (Data for entire census tract.)
b/ "Number of Units" times "Average Number of People/Dwelling Unit."
c/ Includes condominiums, row houses, etc.

2.5.4.1. Removal/Upgrading of Structures: Need.

Structures built before 1933 were built prior to the current earthquake standards for construction; and, although they have survived earthquakes, may have sustained structural damage which, together with their age, tend to be less resistant to potential earthquakes. Therefore, they may be more hazardous to life. In Beverly Hills, about 25 percent of the commercial/office structures were built before this date; and most of these tend to have arch ribs or Summer Bell trusses, both of which have high ceilings which are anchored with bolts at the column. Because the columns may not be made of reinforced concrete or masonry, the joints could separate during seismic activity and the roof and/or wall of a structure could collapse. A row of these structures could move back and forth together and, therefore, reinforce each other; or they could collapse simultaneously. This depends on the strength and direction of movement, etc.

Certain post-1933 structures may be hazardous to life, also. For example, only one structure in Beverly Hills was so badly impacted by the 1971 earthquake that it had to be demolished; it was built in 1941.

The Department of Building & Safety is concerned about these older structures. A study is contemplated to note the quality of each and recommend demolition or rehabilitation, as necessary. Such a program has been successfully undertaken by the City of Long Beach and is being considered in the City and County of Los Angeles.

The soil under any structure in Beverly Hills may be subject to liquefaction. (See Section 3.3.3.3.) In 1971, at least two did suffer adverse impacts because of this activity. The Department of Building & Safety has increased its requirements to avoid such adverse impacts. A study of the aseismic qualities of older buildings could also include a discussion of the propensity for the adverse impacts associated with liquefaction.

Pursuant to seismic considerations, Beverly Hills' public structures tend to be in good condition. Even City Hall (constructed in 1931) remains within the acceptable risk levels.* The structures housing the City's emergency operations -- Fire and Police Departments -- are probably in good condition and should not be made dysfunctional because of seismic activities.

A complete analysis could be done of the aseismic levels of public structures, especially those safety facilities needed in the event of seismic activity (fire, police).

2.5.4.2. Removal/Upgrading of Structures: Program.

A program should be developed to encourage owners to redevelop parcels. This could be done via a bonus system in the <u>Zoning Ordinance</u> that would offer developers greater site coverage or height in exchange for complying with the new aseismic standards.

* City Hall was constructed with reinforced concrete and, therefore, exceeded 1931 building Code requirements.

The City could join with other jurisdictions to encourage the County Tax Assessor to give a special tax incentive to property owners who would upgrade their parcels for this purpose. (There would have to be a change in the State Constitution to achieve this. Nevertheless, there seems to be interest in pursuing this goal by major jurisdictions including San Francisco.)

Finally, consideration must be given to handling those situations which are believed to be hazardous or in excess of the levels of acceptable risk as adopted by the City and the property owners are noncooperative. The potential need for condemnation and police power should be evaluated.

2.5.4.3. Consideration of Removal of Structures.

All else equal, the most severe seismic impact to structures is to those directly on the Fault. Therefore, geologists advocate removal of structures on known faults or traces. After mapping the Santa Monica Fault, a cost-benefit study of this proposal could be done to see the implications to Beverly Hills if it were to implement this minimal goal. The study should evaluate not only costs to the City but also include such factors as:

- loss of property and sales taxes;
- disruption of the commercial/office fabric of the City;
- disturbance to the already problematic vehicular circulation system; and
- effect of new standards for aseismic construction pursuant to acceptable levels of risk for structures atop faults.

2.5.4.4. Compatibility with Adopted Disaster Plan.

The City of Beverly Hills adopted an Emergency Plan on April 1 (Ordinance 75-0-1567). This plan includes procedures for responding to all types of extreme situations, including disruptive seismic activity. It was approved by the State Office of Emergency Services prior to its adoption by the City. Studies proposed herein should be compatible with this Plan.

TABLE 3

Estimate of Number of Units and Number of Structures

Within 150 Feet of the Santa Monica Fault in Beverly Hills

Subarea	Type of Unit	Number of Structures	Number of Units	Average Number of People/ Dwelling Unit[a]	Estimate of Total Number of People Displaced[b]
East of Maple Drive	Single family detached	0	0	1.82	0
	Multi-family[c]	28	296	1.82	538.7
West of Foothill Drive, east of Crescent Drive	Single family detached	1	24	1.82	43.7
	Multi-family[c]	1	1	1.82	18.2
West of Roxbury Drive, east of Spalding Drive	Single family detached	0	0	2.11	0
	Multi-family[c]	5	98	2.11	206.8
West of Spalding Drive	Single family detached	0	0	2.11	0
	Multi-family[c]	34	297	2.11	626.7
TOTAL		69	716	N.R.	1,434.1

Source: Beverly Hills Department of City Planning, May, 1975.
N.B. Includes units only partially within "strip."
N.R. Not relevant.

a/ Source: 1970 U.S. Census of Population. (Data for entire census tract.)
b/ "Number of Units" times "Average Number of People/Dwelling Unit."
c/ Includes condominiums, row houses, etc.

TABLE 3

Principal Geologic Formations in Beverly Hills

System	Series	Stage	Unit (Name)	Symbol	Thickness (in feet)	General Character, Distinctive Features	General Comments
Quaternary	Recent	Upper	Alluvium (Sand)	Qal	0-1,000	Unconsolidated, poorly sorted sand, gravel and silt.	Source of sand and gravel for aggregate; clay for brick. Important as water reservoir and subsurface channelways. Found throughout low level, flat portions of Los Angeles County (areas once underwater).
Quaternary	Pleistocene	Upper	Continental sediments (various names)	Qpu	N.I.	Reddish alluvium. Similar to recent alluvium but commonly more eroded.	Common in Santa Monica, West Los Angeles, Hancock Park, Mid-Wilshire, and West Adams areas.
Tertiary	Miocene	Middle and Upper	Monterey shale	Tml	600-2,000+	Organic to cherty shales, white weathering	Common along sides of mouths of Santa Monica Mountains canyons west of Coldwater Canyon.
Jurassic	N.A.	N.A.	Granitic rocks	pKbc	N.I.	Quartz dioritic rocks.	Common in portions of most Southern California mountains.
Triassic	N.A.	N.A.	Santa Monica slate	Rsm	N.I.	N.I.	Common in Santa Monica Mountains west of La Collina Road (West Hollywood).

Source: State of California, Department of Natural Resources, Division of Mines, Geology of Southern California, Guide No. 2, Figure 2, and Guide No. 3, Table 1. Sacramento: By the author, 1954. Compiled by the Beverly Hills Department of City Planning, May, 1975.

N.B. These formations are plotted on Map C.
N.I. Not included in source.
N.A. Not applicable.

3. BACKGROUND INFORMATION.

3.1. Geomorphology (Geologic Topography).

The City of Beverly Hills is located on a portion of the Coastal Plain of Los Angeles County at the base of the Santa Monica Mountains. The topography varies significantly, as both coastal flatlands and mountainous terrain are included within the City boundaries. The lowest point within the City is at Olympic and La Cienega Boulevards near La Cienega Park (elevation 120 feet above sea level); and the highest point is 1400 feet above sea level along Carla Ridge Drive in the Trousdale Estates section.

The topography of the City tends to be relatively flat south of Santa Monica Boulevard. The land slopes at about 2.0 percent to the southeast. At Santa Monica Boulevard and Moreno Drive the elevation is 270 feet above sea level; at Robertson Boulevard and Whitworth Drive the elevation is 135 feet above sea level.

Between Santa Monica and Sunset Boulevards as well as in the mouths of Benedict and Coldwater Canyons, the terrain slopes at between 2.3 and 2.6 percent (steeper in the northeast portion) to a height of approximately 375 feet above sea level at Sunset Boulevard. North of Sunset Boulevard most areas are composed of relatively hilly terrain with some slopes reaching 42 percent. (See Map 1.)

3.2. Principal Geologic Formations.

Geologic soils are related to the topography discussed in Section 3.1., and they are described on Table 3 and Map 2.

Most of the geologic foundation of Beverly Hills is in alluvium. These are porous and move very easily during seismic activity. This type of soil tends to amplify damage during seismic activity. North of Sunset Boulevard, minor amounts of area are in Monterey Shale; and the remaining geology is composed of Santa Monica slate and granitic rocks. All of these latter types are relatively stable and do not easily move during seismic activity.

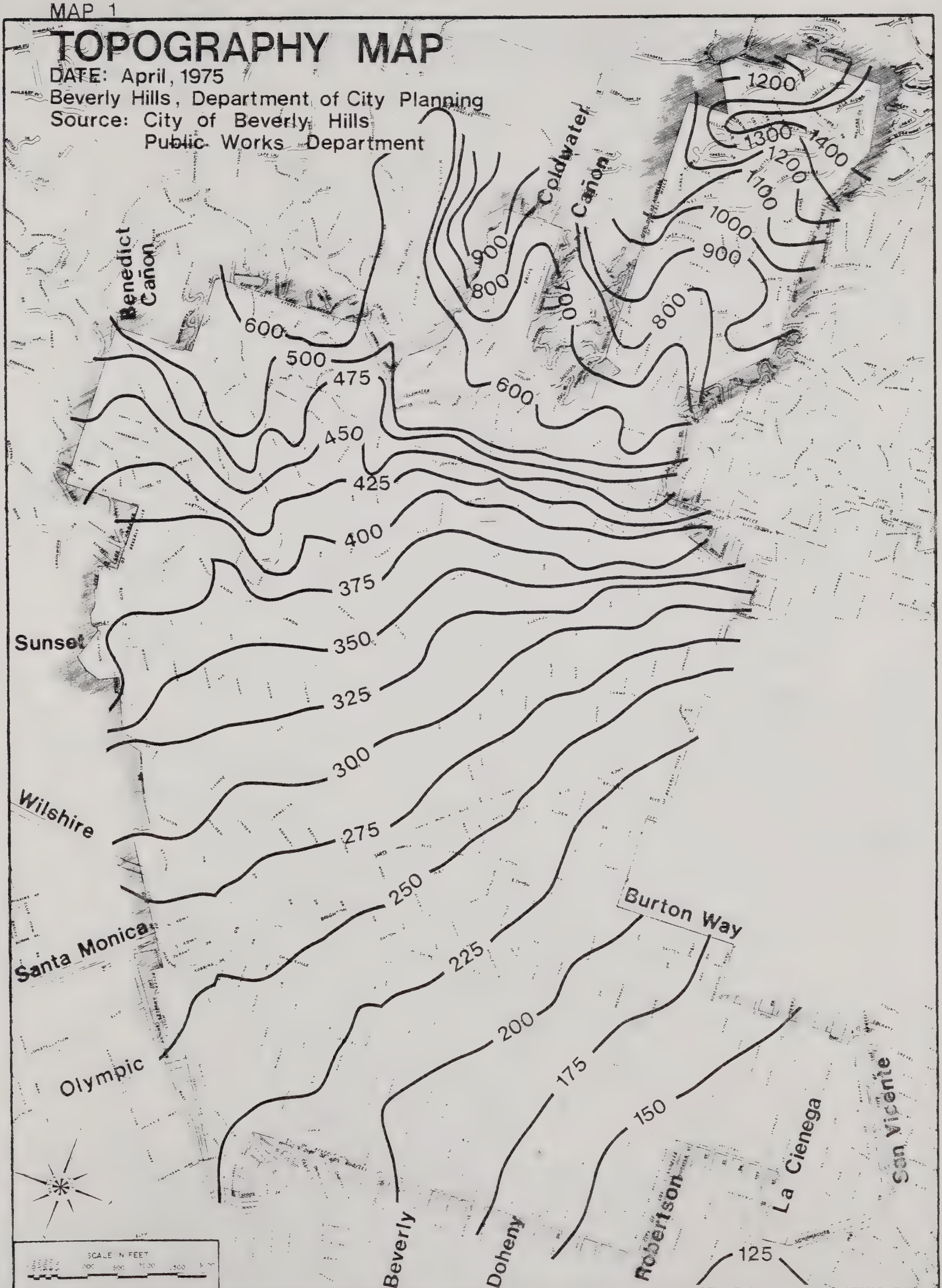
3.3. Faulting.

3.3.1. Systems.

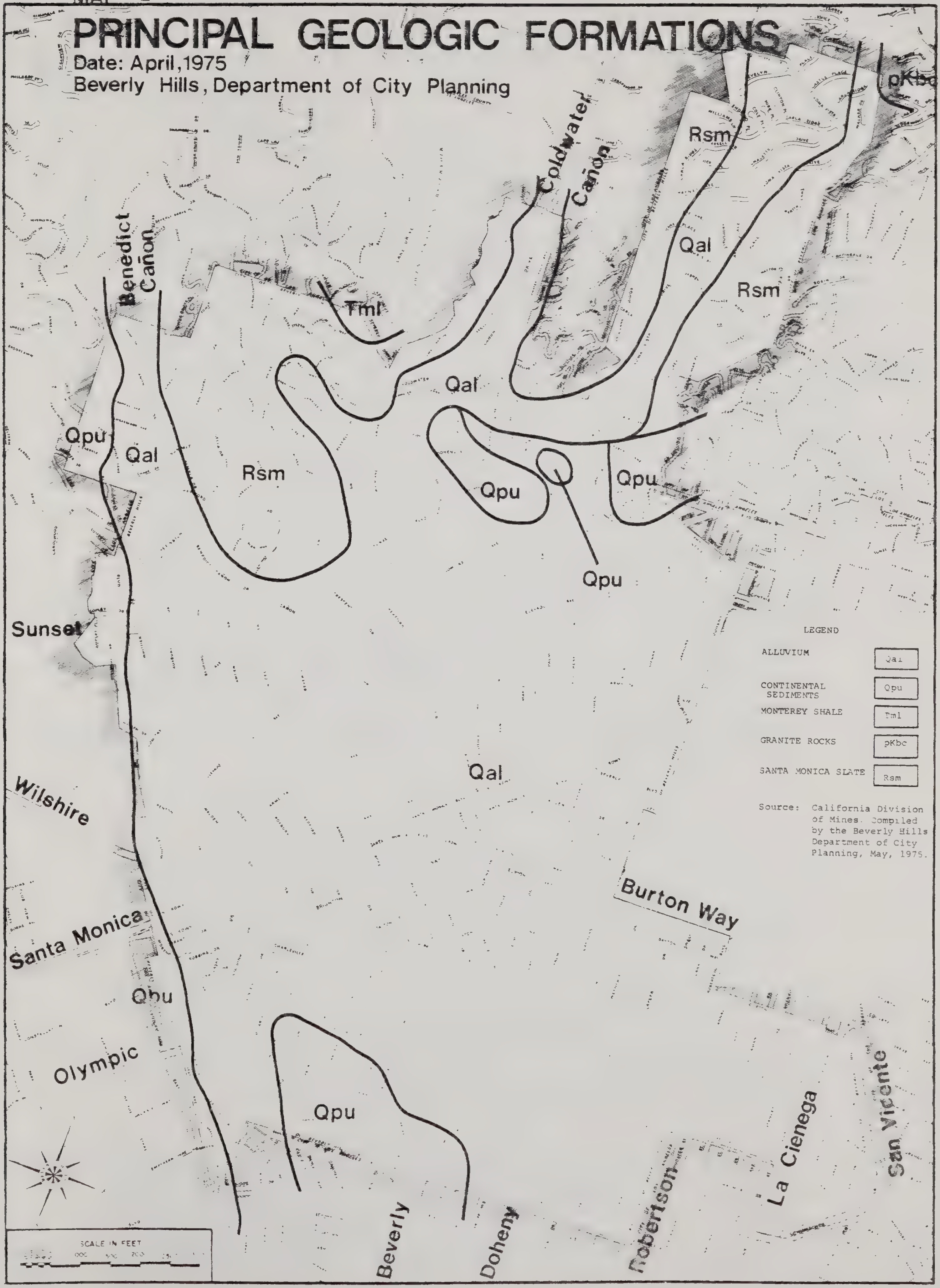
Most parts of California and all portions of Los Angeles County contain active faulting systems. Hence, Beverly Hills is subject to seismic activity of various types from an abundance of fault systems which encircle or bisect it. (See Map 3.)

Of all faults in the region, the San Andreas and Newport (Beach)-Inglewood systems are the most well known and considered to be potentially the most disruptive. Each has had major seismic activity in the past: in 1906, the San Francisco Earthquake occurred along the San Andreas Fault and in 1933, the Long Beach Earthquake occurred on the Newport (Beach)-Inglewood Fault.

MAP 1

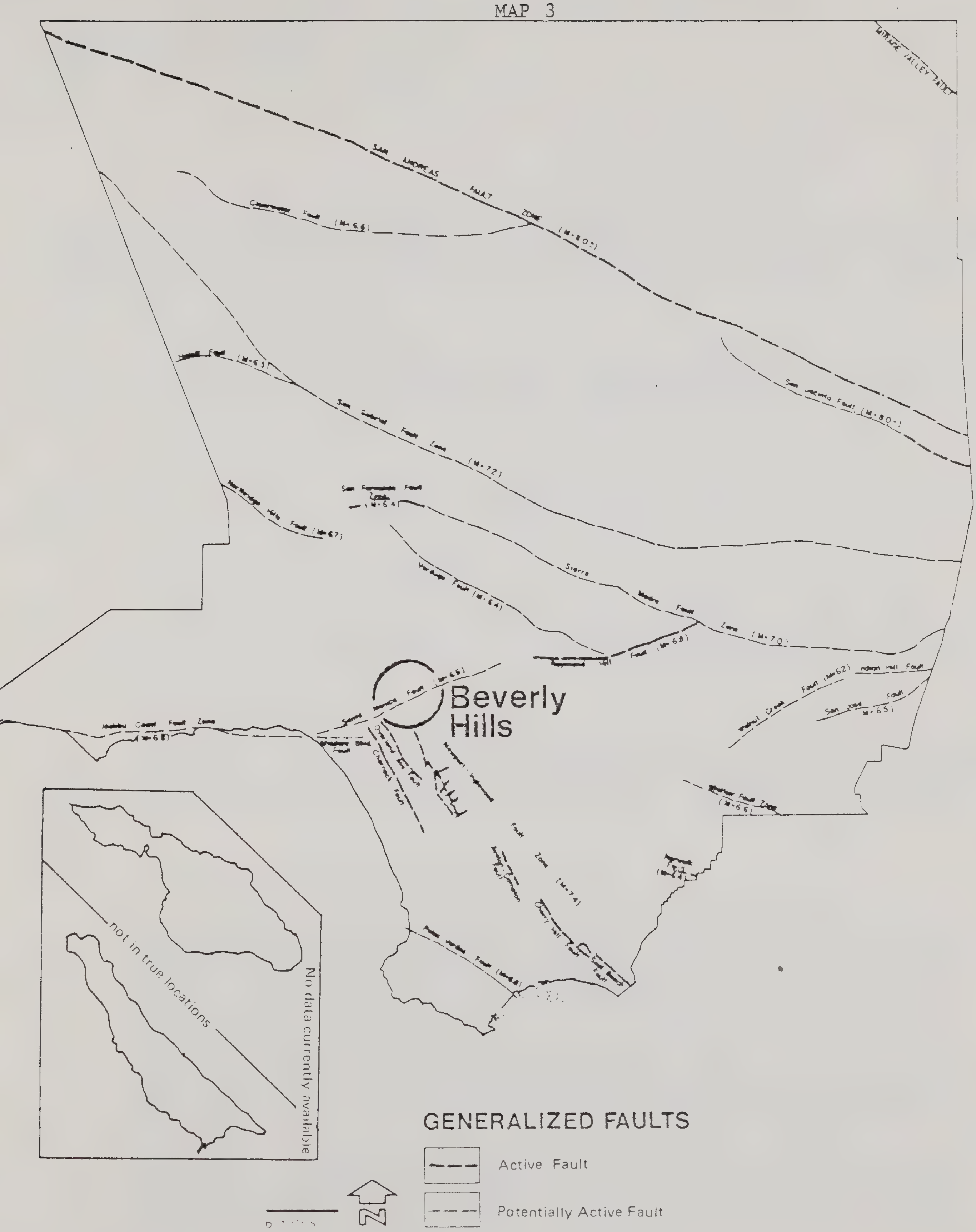

TOPOGRAPHY MAP
DATE: April, 1975
Beverly Hills, Department of City Planning
Source: City of Beverly Hills
Public Works Department
Benedict Cañon
Coldwater Cañon
1200
1300
1400
1200
1100
1000
900
900
800
700
800
600
500
475
600
450
425
400
375
350
325
300
275
250
225
200
175
150
125
Sunset
Wilshire
Santa Monica
Olympic
Burton Way
Beverly
Doheny
Robertson
La Cienega
San Vicente
SCALE IN FEET

MAP 2



PRINCIPAL GEOLOGIC FORMATIONS
Date: April,1975
Beverly Hills, Department of City Planning
Coldwater Cañon
Benedict Cañon
Rsm
Qal
Tml
pKbc
Qpu
Sunset
Wilshire
Santa Monica
Olympic
Burton Way
Beverly
Doheny
Robertson
La Cienega
San Vicente
LEGEND
ALLUVIUM Qal
CONTINENTAL SEDIMENTS Qpu
MONTEREY SHALE Tml
GRANITE ROCKS pKbc
SANTA MONICA SLATE Rsm
Source: California Division of Mines. Compiled by the Beverly Hills Department of City Planning, May, 1975.
SCALE IN FEET

MAP 3



Source: Regional Planning Commission, Los Angeles County General Plan: Seismic Safety Element: Proposed Element, Draft Environmental Impact Report, 1974.

The Santa Monica Fault system bisects Beverly Hills, running about 300 yards south of Santa Monica Boulevard. This fault, which may be part of the Malibu and/or Raymond Faults, has had no recorded seismic activity; however, it is generally labeled as "potentially active."[1/] Theoretically, it could cause severe damage to Beverly Hills because of its location.

Table 4 summarizes miscellaneous data for the most important fault systems in the County. Despite the fact that most are not located in or near Beverly Hills, seismic activity along any of these could have impact upon the City.

3.3.2. Movement Types.

Faults move in a variety of ways. Los Angeles County fault movement types are labeled in Table 4, and they are illustrated and described in Appendix C.

3.3.3. Modes of Earthquake Damage.[2/]

3.3.3.1. Ground Shaking. This can cause the most widespread damage because it affects the largest geographical area of any types of earthquake damage. (Ground shaking associated with the 1906 San Francisco Earthquake, for example, affected about 370,000 square miles.)

3.3.3.2. Surface Faulting. (Fault rupture at surface, e.g., change in surface elevation along fault or portion thereof.) Includes development of grabens (trenches), scarps, fractures or pressure ridges which are visible. Sometimes a gradual slippage occurs. (The 1857 Fort Tejon Earthquake developed a right-lateral displacement of 30 feet.)

3.3.3.3. Ground Failure (i.e., Ground Instability).

- Liquefaction: "Sudden large decrease of shearing resistance of cohesionless soil, caused by a collapse of the structure by shock or strain, and associated with a sudden but temporary increase in the pore fluid pressure. It involves a temporary transformation of material into a fluid mass."[3/] Liquefaction is a potential problem in Beverly Hills. Groundwater is very high in the area south of Santa Monica Boulevard, especially in the blocks east and west of La Cienega Boulevard. Because of this, the Beverly Hills Department of Building & Safety has placed certain structural requirements on buildings. (See Section 3.4.)

- Fracturing, cracking, fissuring, generally produced from ground shaking, settling, landslides, etc., resulting from the earthquake. This could occur in any area of Beverly Hills although it has not happened during recorded history.

1/ See Table 4 for definition of "potentially active" and more data.
2/ A fourth type -- seismic sea waves and seiches -- is unlikely to affect Beverly Hills.
3/ Definition of the American Geological Institute.

TABLE 4

Active or Potentially Active Known Faults in Los Angeles County

Active/ Potentially Active	Name	Maximum Credible Earthquake Magnitude[1/]	Approximate Distance to Beverly Hills (in miles)[2/]	Historic Maximum Reading[1/]	General Characteristics[3/]	Other[1/]
Active[4/]	Newport (Beach)-Inglewood	7.10	5 to south	6.3	Series of an echelon northwest-tending, vertically-dipping faults extending from southern edge of the Santa Monica Mountains southwestward to the offshore area near Newport Beach.	Cause of Long Beach Earthquake, March, 1933; other activity recorded as high as 4.90.
	San Andreas	8.25	36 to east	8.0	Vertical fault plain with a right lateral sense of movement. Approximately 750 miles long extending from the Gulf of California to Cape Mendocino.	Cause of San Francisco Earthquake, April, 1906; other recorded activity as high as 5.50.
	Raymond[5/]	6.80	14 to east	None Recorded	Northeast-southwest-tending fault 16 miles long; serves as a ground water barrier near Pasadena.	
	Norwalk	6.30		4.7	High-angle reverse fault, dipping to the north in east-central Los Angeles County.	
	San Fernando	6.60	14 to north	6.4	East-west-tending fault associated with lateral movements in the northern San Fernando Valley.	Cause of San Fernando Earthquake of February, 1971. (6.8)
	San Jacinto	7.50	36 to east	6.5	Northwest-tending complex series of right-lateral faults extending from the eastern San Gabriel Mountains through Borrego Valley.	
Potentially Active[6/]	Clearwater	6.6	36 to north	None Recorded	East-west-tending fault approximately 28 miles long, located in the Leona Valley and merging with the San Andreas Fault.	
	Holster	6.50	33 to north	None Recorded	Southward dipping, sharply folding reverse fault near Piru Creek west of Saugus.	
	Indian Hill	6.20	36 to east	None Recorded	In Claremont area.	
	Santa Monica or Malibu Coast[7/]	7.00	0	None Recorded	North-dipping thrust fault that extends from West Hollywood to Leo Carrillo Beach and then seaward into ocean.	Probably cause of 1972 Point Mugu Earthquake.
	Mirage Valley	6.20	66 to northeast	None Recorded	Northwest-southeast-tending vertical fault in northeast Los Angeles County.	
	Northridge Hills	6.70	15 to north	None Recorded	Either more than one fault plane or splintering faults, which align and possibly blend with Santa Susana Fault complex in the Northridge District of the San Fernando Valley.	
	Palos Verdes	6.80	18 to south	4.0	9.5-mile long northwestward fault running between Malaga Cove and Los Angeles Harbor in the Palos Verdes area.	Cause of numerous small (less than 4.0) earthquakes.
	San Gabriel	7.20	15 to east	None Recorded	84-mile long fault extending from Frazier Park (Ridge Route area) to Mount Baldy Village.	
	San Jose	6.20	30 to east	None Recorded	In Pomona-Claremont area; fault runs in a southwesterly direction.	
	Sierra Madre	6.50	19 to east	4.9	Series of an echelon moderate angle, north-dipping, reverse faults (thrust faults).	May be part of San Fernando Fault system and, therefore, capable of 6.60.
	Verdugo	6.40	9 to northeast	None Recorded	Northwest-tending, north-dipping fault and a low-angle, reverse fault in Glendale area.	
	Walnut Creek	6.20	24 to east	None Recorded	Northeast-southwest-tending fault 10 miles long in northeast part of San Jose Hills near Walnut.	
	Whittier	7.60	23 to southeast	None Recorded	Northwest-tending fault zone that bisects the Puente Hills/	

Source: State of California, Department of Natural Resources, Division of Mines, Geology of Southern California; Regional Planning Commission, Los Angeles County General Plan: Seismic Safety Element: Proposed Element, Draft Environmental Impact Report, 1974. Compiled by the Beverly Hills Department of City Planning, May, 1975.

N.B. Those faults are plotted on Map D.

1/ Readings are pursuant to Richter scale. (See Appendix A.)
2/ Distance to closest point on fault system, not necessarily location of epicenter if (when) seismic activity were to occur.
3/ Movement types are defined and illustrated in Appendix C.
4/ "Active" is defined by California Council on Intergovernmental Relations in the General Plan Guidelines as follows:

> A fault that has moved in recent geologic time and which is likely to move again in the relatively near future. For geological purposes, there are no precise limits to frequency of movement or probable future movement that define an "active fault." Definitions for planning purposes extend on the order of 10,000 years or more back and 100 years or more forward. The exact time limits for planning purposes are usually defined in relation to contemplated use and structures.

5/ The Raymond Fault is considered as a separate fault system from the Santa Monica and/or Malibu ones here. They may be the same system in fact.
6/ "Potentially Active" is defined by the Association of Engineering Geologists as follows:

> These faults are those, based on available data, along which no known historical ground surface ruptures or earthquakes have occurred. These faults, however, show strong indications of geologically recent activity.

7/ These may be two separate fault systems; or they may be related to the Raymond Fault. It is unknown. See Footnote 4/.

- Compaction, Subsidence, and Uplift. These factors tend to be most prevalent in flat, inland valleys recently depleted of groundwater; therefore, the potential effect in Beverly Hills is not too great. Nevertheless, subsidence might occur along the La Cienega drain.

3.4. Groundwater and Perched Water (Underground water).

Groundwater levels may affect the impact of seismic activity: the higher the groundwater level, the greater the probability of the occurrence of liquefaction. (See Section 3.3.3.3.) Groundwater in Beverly Hills is situated in layers of water-bearing materials known as aquifers which are divided by several geological features. The deposition of water-bearing materials occurred during the Pleistocene period and are known as the San Pedro and Lakewood formations.

The Los Angeles County Flood Control District maintains several wells in Beverly Hills and West Hollywood. Groundwater levels are monitored at these sites. As illustrated on Table 5, the groundwater level is extremely high near the La Cienega drain; and it is relatively high in most parts of the flatlands of the City (e.g., 23.0 feet in Roxbury Park). The high groundwater level increases the probability of liquefaction during seismic activity.

TABLE 5

Groundwater Levels In and Near Beverly Hills

Site	Depth (in feet)	Well Number	Date of Reading
La Cienega Boulevard-Clifton Drive	10.7	2623D	November, 1974
Roxbury Park	23.0	2594B	October, 1974
Melrose Avenue near Westbourne Drive	82.0	2621	January, 1975

Source: Los Angeles County Flood Control District. Compiled by the Beverly Hills Department of City Planning, May, 1975.

Perched water is underground water that lies between the groundwater and the ground level. It is erratic and does not form a solid layer, but is frequently found in the alluvium sector of Beverly Hills. The presence of perched water increases the probability of liquefaction during seismic activity.

3.5. Slope Stability.

Slope stability is a product of various factors including topography and geomorphology, soil type, and geologic foundation. (Except for soil type, these factors are discussed in Sections 3.1. through 3.3. Soil type is described in Appendix D.) Slope stability is affected by such elements as development patterns (e.g., terracing slopes for housing "pads"): rain and water runoff, which can cause erosion; and seismic activity, which could lead to landslides.

According to the Los Angeles County Engineer, slope stability in Beverly Hills varies and is basically related to geologic foundation. In the area composed of alluvium (generally south of Sunset Boulevard) -- the flatter parts of the City -- slope instability is obviously not a problem. Most portions of Beverly Hills hillside areas north of Sunset Boulevard are of Santa Monica slate; and these are characterized by the County Engineer as having "high" or "moderate" landslide potential. The variation tends to be related to development patterns with the more "scarred" areas tending to be more susceptible to erosion and landslide.

3.6. Land Use and Population Distribution.

3.6.1. Land Uses and Activities.

The distribution of land uses and activities can affect the potential impact of seismic events. If all else is equal, the impact on lives and property will be greater in more densely developed areas. Table 6 summarizes land uses in Beverly Hills (1974) and indicates several things relative to seismic considerations:

- Beverly Hills is primarily developed in single family detached residential uses (almost three-fourths of all land). This is the least dense of all developed land uses; and, therefore, during a seismic disturbance, it is the easiest from which to safely egress. It is also the safest because of its low profile: the lower the roof of the structure, the less the chance of falling debris.

  While not reflected on the Table, the multiple family and commercial districts of Beverly Hills are developed in a relatively low density manner. Apartments tend to be two to three stories in height, and typical floor area ratios are 2.0:1. Along Wilshire Boulevard, in the heart of the City's Business Triangle, with one or two exceptions, buildings do not exceed 110 feet in height (approximately 10 stories); and the floor area ratio is about 9:1. On Rodeo Drive and other business streets, the height of structures tends to be below 35 feet and contain a floor area ratio of 2.0:1 to 3:1. (In Downtown Los Angeles, the floor area ratios reach 18:1; and completed structures are as high as 625 feet or 52 stories.)

- There is virtually no large area of undeveloped land, and there is relatively little parkland (2.6 percent). These two land uses tend to remain relatively unaltered during a seismic event.

TABLE 6

Summary of Land Uses in Beverly Hills, 1974

(Net acres)1/

	Acres	Percent
Residential		
Single Family	2,053.0	74.4
Multiple Family	229.6	8.3
Commercial	267.4	9.7
Industrial	3.9	0.1
Educational	53.4	2.0
Public and Quasi Public2/	33.5	1.2
Parks	73.5	2.7
Religious, including schools, etc.	6.5	0.2
Vacant Land	38.2	1.4
Total	2,759.0	100.0

Source: Beverly Hills Department of City Planning, Original Field Work, September, 1974.

1/ Excludes approximately 870 acres of public streets.
2/ Figure includes utilities.

In addition, there are two other features of Beverly Hills' land use development pattern which are related to seismology:

- Franklin Canyon Reservoirs. Two earth-fill dams exist in Franklin Canyon north of the City Limits; if these dams failed during a seismic event, it would impact on the north Beverly Drive-lower Coldwater Canyon districts of Beverly Hills. It is impossible to gauge the exact impact as it is related to the strength and direction of the earthquake, and the level of water in the Reservoirs, etc.

  The Los Angeles (City) Department of Water and Power, owners and operators of the two Reservoirs, plan to replace both because they are substandard relative to modern requirements. DWP intends to start construction on the new Lower Franklin Canyon Reservoir in Spring, 1977, and to be finished with it in 20 to 24 months. Replacement of Upper Franklin Canyon Reservoir has not been scheduled, but will be after that.

  The new reservoirs will be earth-filled and, therefore, of the same type as those that now exist. The new dam for the lower reservoir will be in a slightly different location than now; but the reservoir will hold about th about the same cubic yards of water.

- Filled land. Significant portions of the hilly areas north of Sunset Boulevard have been developed on filled land which is more subject to movement during a seismic disturbance. (See Map D.) Before 1971, and especially prior to 1953, the quality of many Beverly Hills "fill" sites varied.

  Fill tends to be less stable because it is usually not secured as well as natural landforms.

  There is no realistic way to improve the fill while a structure remains on it. However, if the parcel is to be subdivided or redeveloped, the Department of Building & Safety requires an engineering, a geology, and a soils report if it suspects the fill or soils to be insecure; and, if verified, the fill would be improved and brought up to current requirements.

3.6.2. Population Distribution.

The more dense the population, the greater the probability that people will be affected during a seismic event. Beverly Hills' resident population exhibits a relatively low density both in terms of numbers of people per acre and relative to the number of people per dwelling unit; and this is a positive factor pursuant to seismic matters.

As Table 7 illustrates, Beverly Hills' density is lower than that of Los Angeles County; and it varies within different areas of the City. The per gross acre density is lower in those areas with larger parcels and without multiple family units (e.g., Hawthorne-Trousdale and El Rodeo-Benedict). And the per unit family size is lower in those areas composed in part by multiple family units (e.g., Beverly Vista and Horace Mann).

There is no data on the size of the population of Beverly Hills (i.e., shoppers plus employees plus daytime residents plus vehicle occupants, etc.). Of course, it is this maximum population that could be most impacted. Nevertheless, given the relatively low density nature of the City, adverse impact to life would probably be less than in other portions of the region such as in the Mid-Wilshire District or Downtown Los Angeles.

TABLE 7

Density of Beverly Hills Resident Population, 1970

Area*	Population Per Gross Acre	Average Number of Persons Per Dwelling Unit
Hawthorne-Trousdale	6.2	3.0
El Rodeo-Benedict	6.3	3.1
Dayton-Clifton	35.8	1.6
Roxbury Park	32.1	2.1
Beverly Vista	28.8	1.8
Horace Mann	45.6	1.8
Entire City	14.6	2.0
Entire County	3.7	2.4

Source: 1970 U.S. Census of Housing; Beverly Hills Department of City Planning Original Field Work, 1974. Compiled by the Beverly Hills Department of City Planning, May, 1975.

* Areas are defined by 1970 census tract boundaries as follows:

Hawthorne-Trousdale	Census Tract Number 7006
El Rodeo-Benedict	Census Tract Number 7007
Dayton-Clifton	Census Tract Number 7008
Roxbury Park	Census Tract Number 7010
Beverly Vista	Census Tract Number 7009.01
Horace Mann	Census Tract Number 7009.02

4. GLOSSARY OF TERMS.*

Acceleration - Rate of change in velocity, felt as a force by objects. Measured here in g's, where 1.0g is the acceleration of gravity.

Aftershocks - A sequence of smaller shocks following an earthquake.

Alluvium - Geologically recent surface deposits, which have not undergone significant cementation or consolidation. Typically sands, gravels, silts, or clays.

Anticlinal Structure - An elongated fold in a rock mass where the slides or limbs slope downward away from the crest.

Aseismic - Earthquake resistant.

Bedrock - The solid, undisturbed rock in place either at the surface or beneath superficial deposits of soil.

Creep - An imperceptibly slow, more or less continuous downward and outward movement of slope-forming soil or rock.

Epicenter - The point on the earth's surface directly above the focus of an earthquake.

Fault - A plane of breakage in rock or soil, along which significant (greater than an inch or so) offsetting of the two sides of the plane has taken place, due to tectonic forces.

Fault Scarp - A relatively steep, straight ground slope which is caused by the movement along a fault. Types of fault movements are illustrated in Appendix C.

Fault Trace - The line of intersection of a fault surface with the earth's surface.

Fault Zone - Consists of numerous interlacing small faults.

Geomorphology - The study of the topographic composition of the geological formation of the area.

Ground Breakage and Lurching - Surface cracking or distortion due to motions of the ground during an earthquake. Not necessarily directly connected to a fault plane.

Ground Failure - Possible effect of seismic activity on earth materials including but not limited to landsliding, surface rupture, liquefaction, compaction, and subsidence.

Ground Shaking - Motions of the soil or rock during an earthquake. May or may not

* Source: Regional Planning Commission, Los Angeles County General Plan: Seismic Safety Element: Proposed Element, Draft Environmental Impact Report, 1974.

result in breakage, lurching, or other phenomena.

Groundwater - That part of the subsurface water which is in the zone of saturation.

Intensity (Mercalli) - The degree of shaking at a specified place; rated by an experienced observer using a descriptive scale.

Linear Systems, Nodes, and Corridors - As used in the context of this element, a linear system is a network of facilities and rights-of-way providing for the delivery of a commodity or service. Examples discussed in the text include roadways, pipelines, electrical transmission lines and facilities, channels, and communication networks. Such systems are characterized by nodes which may represent an origin, terminus, or intersection of one or more rights-of-way. Corridors have been defined as routes carrying one or more linear systems or segment thereof.

Liquefaction - The sudden loss of strength of soils under saturated conditions due to earthquake shock.

Lurching - Sudden motion at ground surface due to acceleration of the subsoil from earthquake shock.

Maximum Possible Earthquake - The largest earthquake which the geologist estimates could ever occur on the given fault. The probability of such an earthquake occurring is considered to be extremely remote.

Maximum Credible Earthquake - The largest earthquake which the geologist estimates may occur within the life of the proposed structures (50 - 100 years) on the given fault. The probability of such an earthquake is considered to be low, but is definitely within the realm of possibility.

Maximum Probable Earthquake - The largest earthquake which the geologist estimates is likely to occur on the given fault within the life of the structure (50 - 100 years).

Offset - The horizontal and/or vertical distance between two parts of a faulted bed previously joined.

Pleistocene - The next-to-the-last epoch of geologic time; corresponding with the last ice age; its duration was only about 3 million years.

Possible Ground Rupture Zone - For the present study, any mapped fault or historic breakage longer than 1/2 mile in length, with the zone 1/8 mile wide in rock and 1/2 mile in soil.

Quaternary - The second of the two Cenozoic time periods; encompassed both the Pleistocene and Holocene epochs.

Reverse Fault - A steeply inclined fault, on which motion is primarily in a vertical sense, with the "over hanging" side moving upward. Types of fault movements are

illustrated in Appendix C.

(Richter) Magnitude - A measure of the energy released by an earthquake at its source. See Appendix A.

Right or Left Lateral Fault - A fault on which relative motion is primarily in a horizontal sense, with the motion of the opposite side of the fault, when viewed from one side, to either the right or left, respectively. Types of fault movements are illustrated in Appendix C.

Seiche - The oscillation or sloshing of water in a lake, bay, or other enclosed body of water caused by seismic activity or landsliding.

Seismicity - A general term, relating to the general level of earthquake activity in an area.

Slope Stability - The ability of a slope of soil or rock materials to resist moving downhill.

Stratigraphy - Deals with the formation, composition, sequence, and correlation of the stratified rocks as part of the earth's crust.

Subsidiary Faults - Auxiliary cracks either branching obliquely or lying subparallel to the main line of rupture.

Subsidence - A local mass movement of earth material in which surface material is displaced vertically downward as an areal settlement with little or no horizontal component.

Surface Rupture - Ground breakage at the surface caused by faulting.

Tectonic - Designating or pertaining to changes in the structure of the earth's crust, the forces responsible for such deformations, or the external forms produced.

Thrust Fault - A fault that has a low angle of inclination with reference to a horizontal plane. Types of fault movements are illustrated in Appendix C.

Tsunami - A sea wave generated by a submarine earthquake, landslide, or volcanic activity.

5. ENVIRONMENTAL IMPACT REPORT.

5.1. Introduction.

As of December 17, 1973, all general plan elements that are to be individually adopted must have an environmental impact report as part of the adoption process. This action was taken pursuant to Division 13, Chapter 2.6., Section 21083 of the Public Resource Code. This portion of the document, therefore, analyzes the environmental impacts that are likely to occur if the Seismic Safety Element were implemented.

5.2. Project Description.

5.2.1. General.

The Seismic Safety Element identifies the known or probable fault systems, geologic foundation and soil types, and other factors that could affect or be affected by seismic activity in or near Beverly Hills. It evaluates these various factors in order to determine their probable effect on the residents, workers, and shoppers of the City. Further, the Element includes recommendations for action and policy development that would, if implemented, improve the environment by mitigating certain seismic situations in the City.

5.2.2. Present Program.

If adopted, the Element would be incorporated into the City of Beverly Hills General Plan. Therefore, it would serve as a data source and tool for elected officials, commission, staff and members of the public to evaluate and/or strive to increase the levels of seismic safety in the City.

At present, the City has no program pursuant to seismic safety. Beverly Hills, however, does enforce the earthquake-related portions of the Uniform Building Code.[1/] And, in one significant way, the City has a more stringent requirement than that document proposes: the lateral force required by the Code pursuant to a building's weight for medium and/or high rise structures is one hundred percent of the deadload of the structure; in Beverly Hills, the requirement has been increased to 150 percent of the deadload.[2/] (The entire Code section on earthquake regulations is reproduced

1/ The Uniform Building Code was adopted by the City as Ordinance No. 71-0-1405 (with certain modifications). The 1973 edition of the Code (latest edition) has not yet been adopted. Currently, the Department of Building & Safety is reviewing this newer edition in preparation for adoption.

2/ The Department of Building & Safety evaluates the aseismic qualities of a structure relative to the following:

$V = ZKCW$

Where Z = earthquake zone
K = type of structure (construction materials)
C = number of stories
W = weight

Or a dynamic analysis of an individual structure could be done.

in Appendix B of the Seismic Safety Element.

The Seismic Safety Element should be evaluated by enumerating and developing data, actions, and policies related to seismic factors. In addition, the Element must be reviewed relative to other Elements of the General Plan. This must be done for two reasons: first, seismic activity is related to other factors which are discussed in other elements (e.g., land use and housing); and a unified strategy ought to be developed with which to deal with the City's problems. This unified approach is especially significant if City funds are to be expended in support of these programs.

5.2.3. Future Programs.

As new knowledge on faults and soils in Beverly Hills or the Los Angeles Region is developed, data generated in the Element should be updated. The existing data could be transferred to the Land Use Computer File to be developed by the Department of City Planning and the Processing Service Bureau.

5.2.4. Methodology.

In preparing this Element, the following steps were taken:

- basic data was gathered on fault systems, geologic foundation, etc., within Los Angeles County; and these data were related to a set of maps;
- analysis was then made of the potential impact of these factors on Beverly Hills;
- literature was reviewed, and analysis was made in order to propose solutions to the problems; and
- literature was reviewed, and analysis was made in order to cite possible future problems and methods and policies available to mitigate against their development.

5.3. Environmental Setting.

The Environmental Setting of this EIR was discussed in the Environmental Setting Report, published in September, 1975, by the City of Beverly Hills. This report deals with a variety of physical and social forces that influence the environment.

5.4. Environmental Impacts.*

5.4.1. Introduction.

This section analyzes the environmental impacts that would occur if the Seismic Safety Element were adopted and if the recommendations in it were implemented.

* The numerical format of this section and of Section 5.5. follow that of the Environmental Setting Report. The purpose of this is to facilitate joint use of the documents.

5.4.2. General: None.

5.4.3. Soils, Topography, and Geology.

Minor alterations to landforms could be effected if the quality of existing fill were improved. Although espoused herein, this impact would occur regardless of implementation of this Element pursuant to regular Department of Building & Safety practices which require improvement of the quality of substandard fill when new construction or subdivision occurs on the land.

5.4.4. Drainage and Groundwater.

Minor alterations to drainage patterns and to groundwater could occur. If fill were improved, the drainage could be altered slightly; if structures were removed for seismic safety, precipitation would enter the ground directly, thereby possibly affecting drainage, runoff, and groundwater.

5.4.5. Geologic Resources: None.

5.4.6. Vegetation and Wildlife: None.

5.4.7. Historic and Archaeologic Sites.

Although soon to be inventoried, the City has no complete or official list of sites of historic or architectural import; it is impossible to quantify this impact until a thorough investigation of "landmarks" is completed.

5.4.8. Climate: None.

5.4.9. Air Quality: None.

5.4.10. Noise: None.

5.4.11. Community Services.

The Element proposed that the Department of Building & Safety review the aseismic qualities of structures in Beverly Hills, including those that house community services or would be vital in a seismic emergency.

Given the desired level of acceptable risk, this review could cite the need for structural improvement; and, hence, the Element could have an extremely positive impact.

(It is unknown at this time whether any such structures are at levels lower than acceptable risk; a preliminary survey indicates this is not the case. The problem is complicated because certain Beverly Hills services are under the aegis of the County and are not located in the City and are, therefore, not subject to Beverly Hills Seismic Safety Element. The Department of Health is the most significant of these County Services.)

5.4.12. Utilities: None.

5.4.13. Traffic and Circulation.

None. This assumes that the "fault strip" which contemplates removal of structures within certain high-risk areas would not be created. If structures were cleared along the fault, streets might have to be realigned or reconstructed.

5.4.14. Land Use.

The Element discusses two potential impacts relative to land use. First, it cites the generally accepted (but usually not implemented) seismic safety land use criteria: 1) no structure proposed for human habitation or use should be constructed on a fault or fault trace; and 2) structures below certain aseismic level should not be allowed within one-quarter mile of a fault or fault trace. Second, it describes a program to evaluate the seismic quality of structures and concludes that, as needed, structures should be demolished or rehabilitated so that they would be at a minimal aseismic level.

The Element states that it is unlikely that implementation of the first goal could occur in Beverly Hills or in other "built-up" areas if it required removal of existing structures without massive Federal or State aid. The costs for such a project would be staggering and are not within the possibility of the City or probably the State and Federal governments. Costs include land acquisition and demolition of structures on or within a quarter mile of the fault, development of an alternative street system that does not conflict with the fault, and, presumably, redevelopment of the "fault strip" into something attractive such as a park. Because of these costs, it is unlikely that the proposal could be implemented in Beverly Hills, hence, no impact is expected.

The second factor, however, might be implemented and thus could have an impact upon the City. Streetscapes in Beverly Hills tended to be built during the same period; presumably, most structures built at the same time would have the same aseismic construction characteristics and, therefore, it is possible that sections of City blocks or even entire street facades would be affected. If the City were to undertake a systematic effort which would modify the character of the City on an area-by-area basis rather than on the single parcel-single building pattern basis by which change generally occurs in the Business Triangle, several parcels could be redeveloped together with interior circulation systems, thereby affecting on-street vehicular and pedestrian patterns. This type of effort could lead to a change in the types of commercial outlets found on different streets in the Business Triangle.

5.4.15. Demographic Characteristics.

None. This assumes no demolition of residential units.

5.4.16. Economic/Financial.

Economic/Financial considerations have been discussed elsewhere, especially in the

land use section. (See Section 5.4.14.) It is impossible to estimate the actual dollar costs for implementing various portions of the Seismic Safety Element if, in fact, such implementation were desirable. Implementation cost data hinges on the completion of several studies.

5.4.17. Aesthetic/Design.

If a significant number of structures were demolished and if new ones were constructed on the site, the aesthetic/design character of portions of the Business Triangle or of commercial strips might be altered. Architectural styles, bulk, and internal site location patterns change over time; therefore, it may be expected that new structures could be very dissimilar to those now on the ground, giving a different character to the street. (For example, note the difference between Barclay's Bank Building and adjoining retail service outlets.)

5.5. Mitigation Measures Proposed to Minimize the Adverse Impacts.

5.5.1. Introduction: None.

5.5.2. General: None.

5.5.3. Soils, Topography, and Geology: None.

5.5.4. Drainage and Groundwater.

None. It is expected that impacts would be addressed as a matter of course by the Department of Building & Safety.

5.5.5. Geologic Resources: None.

5.5.6. Vegetation and Wildlife: None.

5.5.7. Historic and Archaeologic Sites.

None. Until enumeration of sites of historic and architectural impact occurs, it is uncertain whether there will be an impact. Thus, there was no analysis on possible mitigation measures herein.

5.5.8. Climate: None.

5.5.9. Air Quality: None.

5.5.10. Noise: None.

5.5.11. Community Services: None.

5.5.12. Utilities: None.

5.5.13. Traffic and Circulation: None.

5.5.14. Land Use: None.

5.5.15. Demographic Characteristics: None.

5.5.16. Economic/Financial.

The cost of studies described in Section 2.5 would be incurred by the City. Other financial costs would be estimated by these studies and include those associated with structural rehabilitation/demolition, etc. See Sections 5.4.16 and 5.10.

5.5.17. Aesthetic/Design: None.

5.6. Adverse Environmental Effects Which Cannot Be Avoided if the Element Were Implemented: Economic/Financial. See Sections 5.5.16. and 5.10.

5.7. Alternatives to the Proposed Action.

5.7.1. No project, i.e., no Seismic Safety Element.

If the Seismic Safety Element were not adopted, the City might be held in violation of Section 65302 (g) of the Government Code and might make Beverly Hills liable to legal sanctions, to insure a "proper" Element.

5.7.2. Complete Elimination of Seismic Safety Hazards.

Given existing technology, this alternative is impossible to achieve as long as people inhabit, work in, or visit Beverly Hills.

5.7.3. Elimination of Certain Seismic Hazards But Not Others.

Certain seismic hazards might be eliminated but not others. For example, the quality of aseismic construction could be increased while the removal of on-fault structures might not occur. The Seismic Safety Element has proposed those measures believed most likely to be implemented, priorities may dictate that implementation activities be taken in other sequences.

5.7.4. Proposition of Less Stringent Actions.

Less stringent actions than those proposed in Section 5.7.2. might have been considered. It is probable that less stringent measures would have had little or no effect upon the seismic environment; and, thus, this alternative would have been unable to significantly mitigate seismic effects. As a result, this alternative might, in fact, be equal to the "No Project" alternative.

5.8. Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity.

The Element attempts to continue to maintain current land uses and activities in order not to cause economic hardship. It also suggests various methods by which a safer environment may be created relative to seismic factors. Therefore, it would maintain and enhance the short- and long-term environment by reducing exposure to seismic hazards.

5.9. Irreversible Environmental Changes Which Would Be Involved in the Proposed Action Should It Be Implemented.

The seismic environment of the City would be vastly improved if the Element were implemented. Therefore, the City would be safer, and there would be less chance of loss of life or property pursuant to potential seismic activity.

5.10. Growth-Inducing Impact.

Implementation of the Element would not cause economic or population growth. It could, however, cause a decline in Beverly Hills economic situation. Unless carefully and realistically implemented, the program to incorporate seismic considerations into land use planning and building construction standards could have dysfunctional results to the City. The program might become disruptive and discourage new construction and cause stores and/or offices to relocate elsewhere, including nearby areas which may result in a shift in growth patterns and economic activity. Proposals to avoid these impacts are discussed in the Element.

6. APPENDICES.

6.1. Appendix A.

Richter Magnitude Scale*

The Richter Magnitude Scale, named after Dr. Charles F. Richter, Professor Emeritus of the California Institute of Technology, measures the energy of an earthquake at its source, and is the scale most commonly used but often misunderstood. On this scale, the earthquake's magnitude is expressed in whole numbers and decimals. However, Richter magnitudes can be confusing and misleading unless the mathematical basis for the scale is understood. It is important to recognize that magnitude varies logarithmically with the wave amplitude of the quake recorded by the seismograph. Each whole number step of magnitude on the scale represents an increase of 10 times in the measured wave amplitude of an earthquake, and an increase of 31 times in the amount of energy released by the quake. Thus, the amplitude of an 8.3 earthquake releases almost one million times more energy than one of magnitude 4.3.

A quake of magnitude 2 on the Richter Scale is the smallest quake normally felt by humans. Earthquakes with a Richter magnitude 7 or more are commonly considered to be major. The Richter magnitude scale has no fixed maximum or minimum; observations have placed the largest recorded earthquakes in the world at about 8.9, and the smallest at about 3. Earthquakes with magnitudes smaller than 2 are called "microearthquakes." Richter magnitudes are not used to estimate resulting earthquake damage. An earthquake in a densely populated area, which results in many deaths and considerable damage, may have the same magnitude as an earthquake that occurs in a barren, remote area, that may do nothing more than frighten the wildlife.

* Source: Regional Planning Commission, Los Angeles County General Plan: Seismic Safety Element: Proposed Element, Draft Environmental Impact Report, 1974.

Live Loads Posted

Sec. 2309. The live loads for which each floor or part thereof of a commercial or industrial building is or has been designed shall have such designed live loads conspicuously posted by the owner in that part of each story in which they apply, using durable metal signs, and it shall be unlawful to remove or deface such notices. The occupant of the building shall be responsible for keeping the actual load below the allowable limits.

Retaining Walls

Sec. 2310. Retaining walls shall be designed to resist the lateral pressure of the retained material in accordance with accepted engineering practice. Walls retaining drained earth may be designed for pressure equivalent to that exerted by a fluid weighing not less than 30 pounds per cubic foot and having a depth equal to that of the retained earth. Any surcharge shall be in addition to the equivalent fluid pressure.

Footing Design

Sec. 2311. See Chapter 29.

Walls and Structural Framing

Sec. 2312. (a) **General.** Walls and structural framing shall be erected true and plumb in accordance with the design. Bracing shall be placed during erection wherever necessary to take care of all loads to which the structure may be subjected.

(b) **Interior Walls.** Interior walls, permanent partitions, and temporary partitions which exceed 6 feet in height shall be designed to resist all loads to which they are subjected but not less than a force of five pounds per square foot applied perpendicular to the walls. The deflection of such walls under a load of five pounds per square foot shall not exceed 1/240 of the span for walls with brittle finishes and 1/120 of the span for walls with flexible finishes. See Table No. 23-I for earthquake design requirements where such requirements are more restrictive.

Anchorage

Sec. 2313. Concrete or masonry walls shall be anchored to all floors and roofs which provide lateral support for the wall or are required to provide stability for the wall. Such anchorage shall be capable of resisting the horizontal forces specified in this Chapter or a minimum force of 200 pounds per linear foot of wall, whichever is the larger. Required anchors in masonry walls of hollow units or cavity walls shall enter a reinforced grouted structural element of the wall.

Earthquake Regulations

Sec. 2314. (a) **General.** Every building or structure and every portion thereof shall be designed and constructed to resist stresses produced by lateral forces as provided in this Section. Stresses shall be calculated as the effect of a force applied horizontally at each floor or roof level above the foundation. The force shall be assumed to come from any horizontal direction.

The provisions of this Section apply to the structure as a unit and also to all parts thereof, including the structural

Earthquake Regulations (Continued)

frame or walls, floor and roof systems, and other structural features.

(b) **Definitions.** The following definitions apply only to the provisions of this Section:

BOX SYSTEM is a structural system without a complete vertical load-carrying space frame. In this system the required lateral forces are resisted by shear walls as hereinafter defined.

LATERAL FORCE RESISTING SYSTEM is that part of the structural system to which the lateral forces prescribed in Section 2314 (d) 1 are assigned.

SHEAR WALL is a wall designed to resist lateral forces parallel to the wall. Braced frames subjected primarily to axial stresses shall be considered as shear walls for the purpose of this definition.

SPACE FRAME is a three-dimensional structural system composed of interconnected members, other than bearing walls, laterally supported so as to function as a complete self-contained unit with or without the aid of horizontal diaphragms or floor bracing systems.

SPACE FRAME-DUCTILE MOMENT RESISTING is a space frame-moment resisting complying with the requirements for a ductile moment resisting space frame as given in Section 2314 (j).

SPACE FRAME-MOMENT RESISTING is a vertical load carrying space frame in which the members and joints are capable of resisting design lateral forces by bending moments.

SPACE FRAME—VERTICAL LOAD-CARRYING is a space frame designed to carry all vertical loads.

(c) **Symbols and Notations.** The following symbols and notations apply only to the provisions of this Section.

C = Numerical coefficient for base shear as specified in Section 2314 (d) 1.

C_p = Numerical coefficient as specified in Section 2314 (d) 2 and as set forth in Table No. 23-I.

D = The dimension of the building in feet in a direction parallel to the applied forces.

D = The plan dimension of the vertical lateral force resisting system in feet.

F_i, F_n, F_x = Lateral force applied to level "i," "n," or "x," respectively.

F_p = Lateral forces on the part of the structure and in the direction under consideration.

F_t = That portion of "V" considered concentrated at the top of the structure, at the level "n." The remaining

Earthquake Regulations (Continued)

portion of the total base shear "V" shall be distributed over the height of the structure including level "n" according to Formula (14-5).

h_i, h_n, h_x = Height in feet above the base to level "i," "n," or "x," respectively.

J = Numerical coefficient for base moment as specified in Section 2314 (h).

J_x = Numerical coefficient for overturning moment at level "x."

K = Numerical coefficient as set forth in Table No. 23-H.

Level i = Level of the structure referred to by the subscript "i."

Level n = That level which is uppermost in the main portion of the structure.

Level x = That level which is under design consideration.

M = Overturning moment at the base of the building or structure.

M_x = The overturning moment at level "x."

N = Total number of stories above exterior grade.

T = Fundamental period of vibration of the building or structure in seconds in the direction under consideration.

V = Total lateral load or shear at the base.

$$V = F_t + \sum_{i=1}^{n} F_i$$

where $i = 1$ designates first level above the base

W = Total dead load including partitions using the actual weight of the partitions or the partition loading specified in Section 2302 (b).

$$W = \sum_{i=1}^{n} w_i$$

EXCEPTION: "W" shall be equal to the total dead load plus 25 per cent of the floor live load in storage and warehouse occupancies.

w_i, w_x = That portion of "W" which is located at or is assigned to level "i" or "x" respectively.

W_p = The weight of a part or portion of a structure.

Z = Numerical coefficient dependent upon the zone as determined by ~~Figures No. 1, No. 2 and No. 3 in this~~ OK .

 #1 #2 #3

Earthquake Regulations (Continued)

Chapter. For locations in Zone No. 1 "Z" shall be equal to one-fourth. For locations in Zone No. 2 "Z" shall be equal to one-half. For locations in Zone No. 3 "Z" shall be equal to one.

(d) **Minimum Earthquake Forces for Structures. 1. Total lateral force and distribution of lateral force.** Every structure shall be designed and constructed to withstand minimum total lateral seismic forces assumed to act nonconcurrently in the direction of each of the main axes of the structure in accordance with the following formula:

$$V = ZKCW \qquad (14\text{-}1)$$

The value of "K" shall be not less than that set forth in Table No. 23-H. The value of "C" shall be determined in accordance with the following formula:

$$C = \frac{0.05}{\sqrt[3]{T}} \qquad (14\text{-}2)$$

Except as provided in Table No. 23-I, the maximum value of "C" need not exceed 0.10. For all one- and two-story buildings the value of "C" shall be considered as 0.10.

"T" is the fundamental period of vibration of the structure in seconds in the direction under consideration. Properly substantiated technical data for establishing the period "T" may be submitted. In the absence of such data, the value of "T" for buildings shall be determined by the following formula:

$$T = \frac{0.05h_n}{\sqrt{D}} \qquad (14\text{-}3)$$

EXCEPTION: In all buildings in which the lateral force resisting system consists of a moment-resisting space frame which resists 100 per cent of the required lateral forces and which frame is not enclosed by or adjoined by more rigid elements which would tend to prevent the frame from resisting lateral forces:

$$T = 0.10N \qquad (14\text{-}3A)$$

The total lateral force "V" shall be distributed in the height of the structure in the following manner:

$$F_t = .004V \left(\frac{h_n}{D_s}\right)^2 \qquad (14\text{-}4)$$

"F_t" need not exceed 0.15 "V" and may be considered as 0 for values $\left(\frac{h_n}{D_s}\right)$ of 3 or less, and

Earthquake Regulations (Continued)

$$F_x = \frac{(V - F_t)\, w_x h_x}{\sum_{i=1}^{n} w_i h_i} \qquad (14\text{-}5)$$

EXCEPTION: One- and two-story buildings shall have uniform distribution.

At each level designated as "x," the force "F_x" shall be applied over the area of the building in accordance with the mass distribution on that level.

2. **Lateral force on parts or portions of buildings or other structures.** Parts or portions of buildings or structures and their anchorage shall be designed for lateral forces in accordance with the following formula:

$$F_p = ZC_pW_p \qquad (14\text{-}6)$$

The values of "C_p" are set forth in Table No. 23-I. The distribution of these forces shall be according to the gravity loads pertaining thereto.

3. **Pile foundations.** Individual pile or caisson footings of every building or structure shall be interconnected by ties each of which can carry by tension and compression a horizontal force equal to 10 per cent of the larger pile cap loading unless it can be demonstrated that equivalent restraint can be provided by other approved methods.

(e) **Distribution of Horizontal Shear.** Total shear in any horizontal plane shall be distributed to the various elements of the lateral force resisting system in proportion to their rigidities considering the rigidity of the horizontal bracing system or diaphragm.

Rigid elements that are assumed not to be part of the lateral force resisting system may be incorporated into buildings provided that their effect on the action of the system is considered and provided for in the design.

Add DYNAMIC ANALYSIS

(f) **Drift.** Lateral deflections or drift of a story relative to its adjacent stories shall be considered in accordance with accepted engineering practice.

(g) **Horizontal Torsional Moments.** Provisions shall be made for the increase in shear resulting from the horizontal torsion due to an eccentricity between the center of mass and the center of rigidity. Negative torsional shears shall be neglected. Where the vertical resisting elements depend on diaphragm action for shear distribution at any level, the shear-resisting elements shall be capable of resisting a torsional moment assumed to be equivalent to the story shear acting with an eccentricity of not less than five per cent of the maximum building dimension at that level.

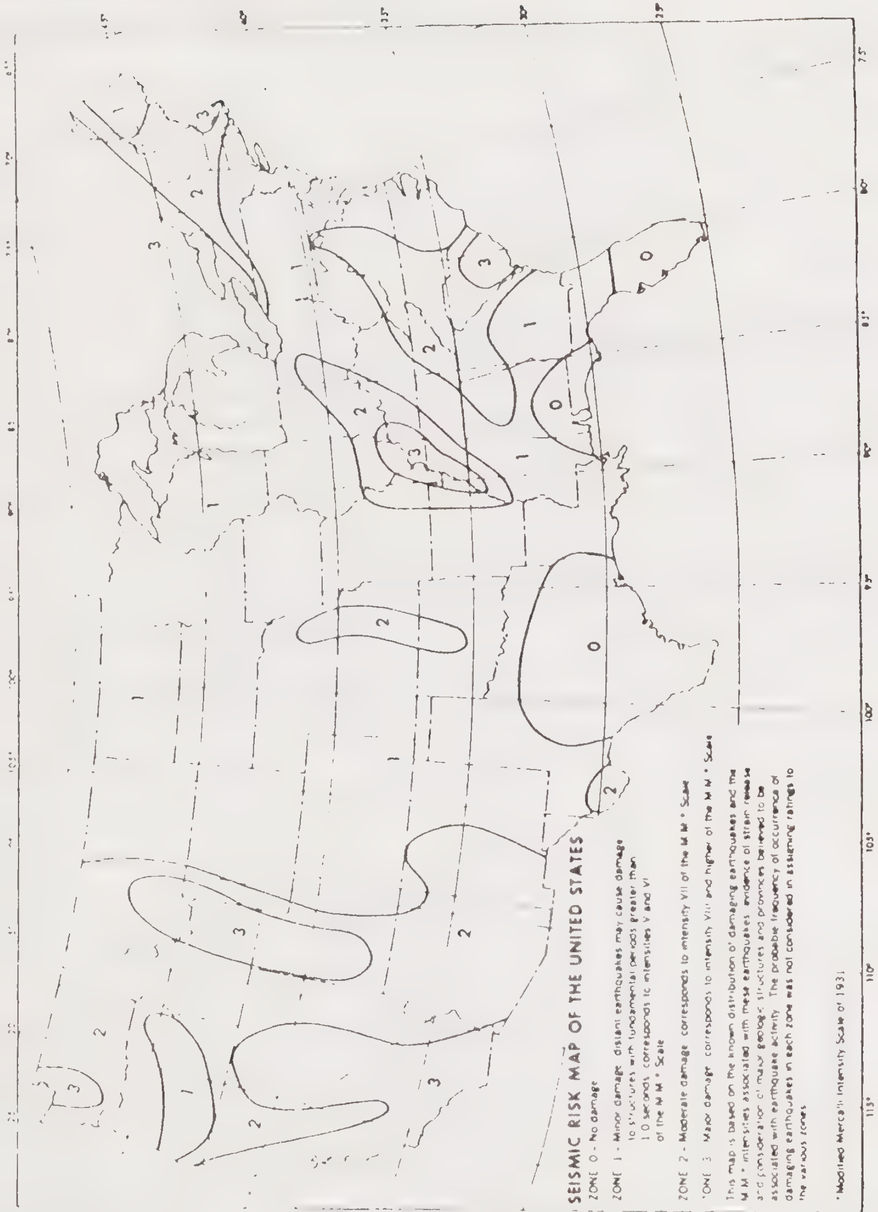


FIGURE NO. 1 — SEISMIC ZONE MAP OF THE UNITED STATES

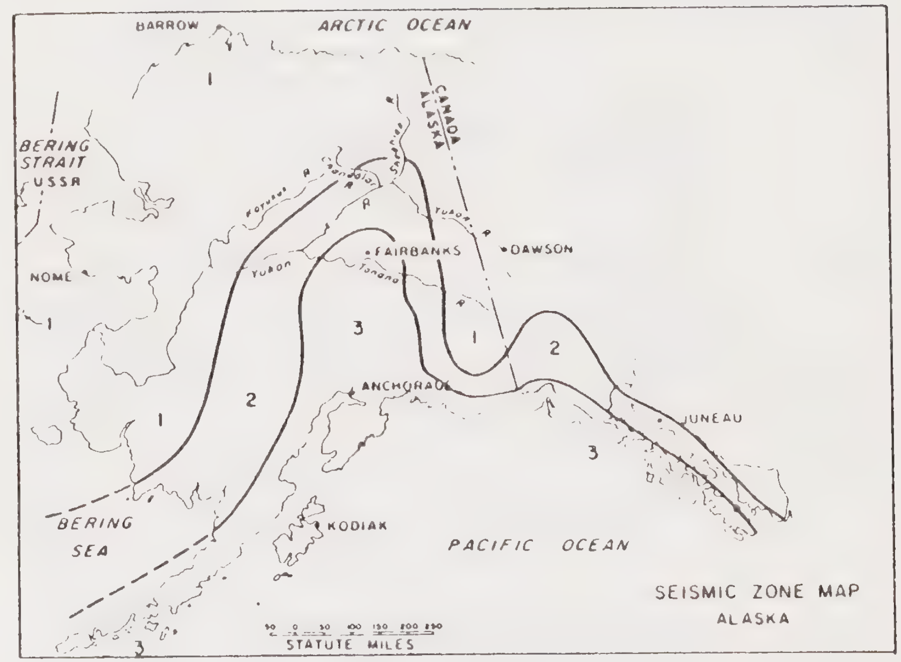


FIGURE NO. 2 — STATE OF ALASKA

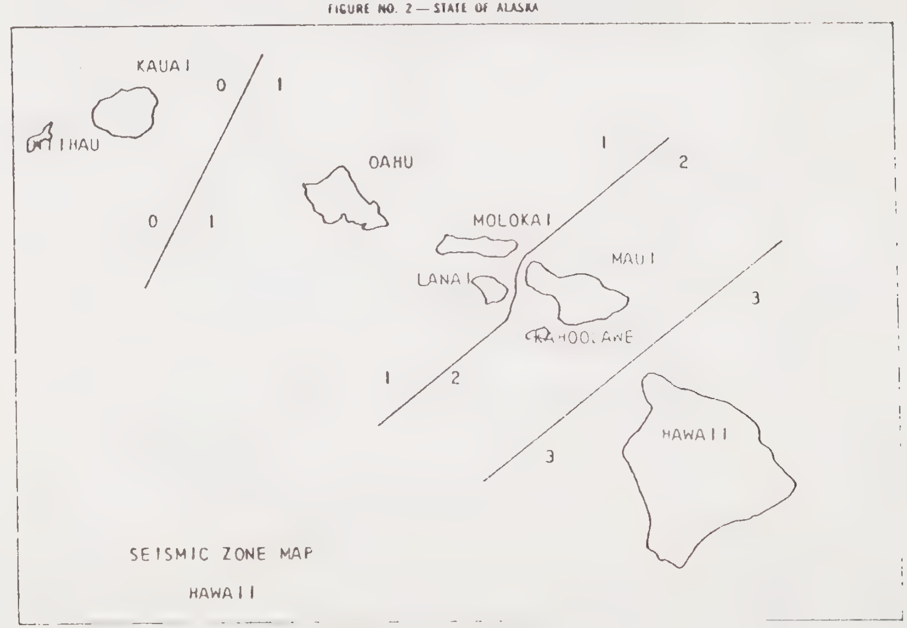


FIGURE NO. 3 — STATE OF HAWAII

Earthquake Regulations (Continued)

(h) **Overturning.** Every building or structure shall be designed to resist the overturning effects caused by the wind forces and related requirements specified in Section 2308, or the earthquake forces specified in this Section, whichever governs.

EXCEPTION: The axial loads from earthquake forces on vertical elements and footings in every building or structure may be modified in accordance with the following provisions:

1. The overturning moment, "M", at the base of the building or structure shall be determined in accordance with the following formula:

$$M = J(F_t h_n + \sum_{i=1}^{n} F_i h_i) \quad \text{.................(14-7)}$$

WHERE:

$$J = \frac{0.6}{\sqrt[3]{T^2}} \quad \text{. . . . . . . (14-8)}$$

The value of "J" need not be more than 1.00. For structures other than buildings the value of "J" shall be not less than 0.45.

2. The overturning moment, "M_x", at any level designated as "x" shall be determined in accordance with the following:

$$M_x = J_x [F_t (h_n - h_x) + \sum_{i=x}^{n} F_i (h_i - h_x)] \text{....(14-9)}$$

WHERE:

$$J_x = J + (1 - J) \left(\frac{h_x}{h_n} \right)^3 \text{.............(14-10)}$$

At any level the incremental changes of the design overturning moment, in the story under consideration, shall be distributed to the various resisting elements in the same proportion as the distribution of the shears in the resisting system. Where other vertical members are provided which are capable of partially resisting the overturning moments, a resdistribution may be made to these members if framing members of sufficient strength and stiffness to transmit the required loads are provided.

Where a vertical resisting element is discontinuous, the overturning moment carried by the lowest story of that element shall be carried down as loads to the foundation.

(i) **Setbacks.** Buildings having setbacks wherein the plan dimension of the tower in each direction is at least 75

Earthquake Regulations (Continued)

per cent of the corresponding plan dimension of the lower part may be considered as a uniform building without setbacks for the purpose of determining seismic forces.

For other conditions of setbacks the tower shall be designed as a separate building using the larger of the seismic coefficients at the base of the tower determined by considering the tower as either a separate building for its own height or as part of the over-all structure. The resulting total shear from the tower shall be applied at the top of the lower part of the building which shall be otherwise considered separately for its own height.

EXCEPTION: Nothing in this subsection shall be deemed to prohibit the submission of properly substantiated technical data for establishing the lateral design forces by a dynamic analysis.

(j) **Structural Systems. 1. Design requirements.** Buildings more than 160 feet in height shall have a ductile moment-resisting space frame capable of resisting not less than 25 per cent of the required seismic force for the structure as a whole. All buildings designed with a horizontal force factor "K" of 0.67 or 0.80 shall have a ductile moment-resisting space frame of structural steel (complying with Section 2722 for buildings in Seismic Zones No. 2 and No. 3 or Section 2723 for buildings in Seismic Zone No. 1) or of reinforced concrete (complying with Section 2630 for buildings in Seismic Zones No. 2 and No. 3 or Section 2631 for buildings in Seismic Zone No. 1).

EXCEPTIONS: 1. Buildings more than 160 feet in height in Seismic Zone No. 1 may have concrete shear walls designed in conformance with Section 2632 of this Code in lieu of a ductile moment-resisting space frame, provided a "K" value of 1.00 or 1.33 is utilized in the design.

2. Other structural concepts may be approved by the Building Official when evidence is submitted showing that equivalent ductility and energy absorption are provided.

Moment-resisting space frames and ductile moment-resisting space frames may be enclosed by or adjoined by more rigid elements which would tend to prevent the space frame from resisting lateral forces where it can be shown that the action or failure of the more rigid elements will not impair the vertical and lateral load-resisting ability of the space frame.

2. **Construction.** The necessary ductility for a ductile moment-resisting space frame shall be provided by a frame of structural steel with moment-resisting connections (complying with Section 2722 for buildings in Seismic Zones No. 2 and No. 3 or Section 2723 for buildings in Seismic Zone No. 1) or by a reinforced concrete frame (complying with Section 2630 for buildings in Seismic Zones No. 2 and No. 3 or Section 2631 for buildings in Seismic Zone No. 1).

Shear walls in buildings where $K = 0.80$ shall be composed of axially loaded bracing members of A36, A440, A441, A572

Earthquake Regulations (Continued)

(except Grades 60 and 65) or A588 Grades A, B or C structural steel; or reinforced concrete bracing members or walls conforming with the requirements of Section 2632.

Reinforced concrete shear walls and reinforced concrete braced frames for all buildings shall conform to the requirements of Section 2632. In buildings where $K = 0.67$ and $K = 0.80$, all structural elements below the base required to transmit seismic forces to the foundation shall be composed of structural steel (complying with Section 2722 for buildings in Seismic Zones No. 2 and No. 3 or Section 2723 for buildings in Seismic Zone No. 1) or by reinforced concrete (complying with Section 2630 for buildings in Seismic Zones No. 2 and No. 3 or with Section 2631 for buildings in Seismic Zone No. 1 and with Section No. 2632 for buildings in Seismic Zones Nos. 1, 2, and 3).

(k) **Design Requirements.** 1. **Building separations.** All portions of structures shall be designed and constructed to act as an integral unit in resisting horizontal forces unless separated structurally by a distance sufficient to avoid contact under deflection from seismic action or wind forces.

2. **Minor alterations.** Minor structural alterations may be made in existing buildings and other structures, but the resistance to lateral forces shall be not less than that before such alterations were made, unless the building as altered meets the requirements of this Section of the Code.

3. **Reinforced masonry or concrete.** All elements within the structure which are of masonry or concrete and which resist seismic forces or movement shall be reinforced so as to qualify as reinforced masonry or concrete under the provisions of Chapters 24 and 26. Principal reinforcement in masonry shall be spaced 2 feet maximum on center in buildings using a moment-resisting space frame.

4. **Combined vertical and horizontal forces.** In computing the effect of seismic force in combination with vertical loads, gravity load stresses induced in members by dead load plus design live load, except roof live load, shall be considered.

5. **Exterior elements.** Precast, nonbearing, non-shear wall panels or other elements which are attached to, or enclose the exterior, shall accommodate movements of the structure resulting from lateral forces or temperature changes. The concrete panels or other elements shall be supported by means of poured-in-place concrete or by mechanical fasteners in accordance with the following provisions:

A. Connections and panel joints shall allow for a relative movement between stories of not less than two times story drift caused by wind or seismic forces; or ¼ inch whichever is greater.

B. Connections shall have sufficient ductility and rotation capacity so as to preclude fracture of the concrete or brittle

failures at or near welds. Inserts in concrete shall be attached to, or hooked around reinforcing steel, or otherwise terminated so as to effectively transfer forces to the reinforcing steel.

Earthquake Regulations (Continued)

C. Connections to permit movement in the plane of the panel for story drift may be properly designed sliding connections using slotted or oversize holes or may be connections which permit movement by bending of steel.

(l) **Earthquake Recording Instrumentations.** For earthquake recording instrumentations see Appendix, Section 2314 (l).

Heliport and Helistop Landing Areas

Sec. 2315. In addition to other design requirements of this Chapter, heliport and helistop landing or touchdown areas shall be designed for the maximum stress induced by the following:

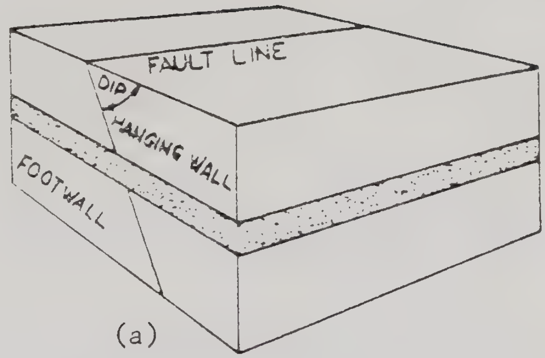
1. Dead load plus actual weight of the helicopter.

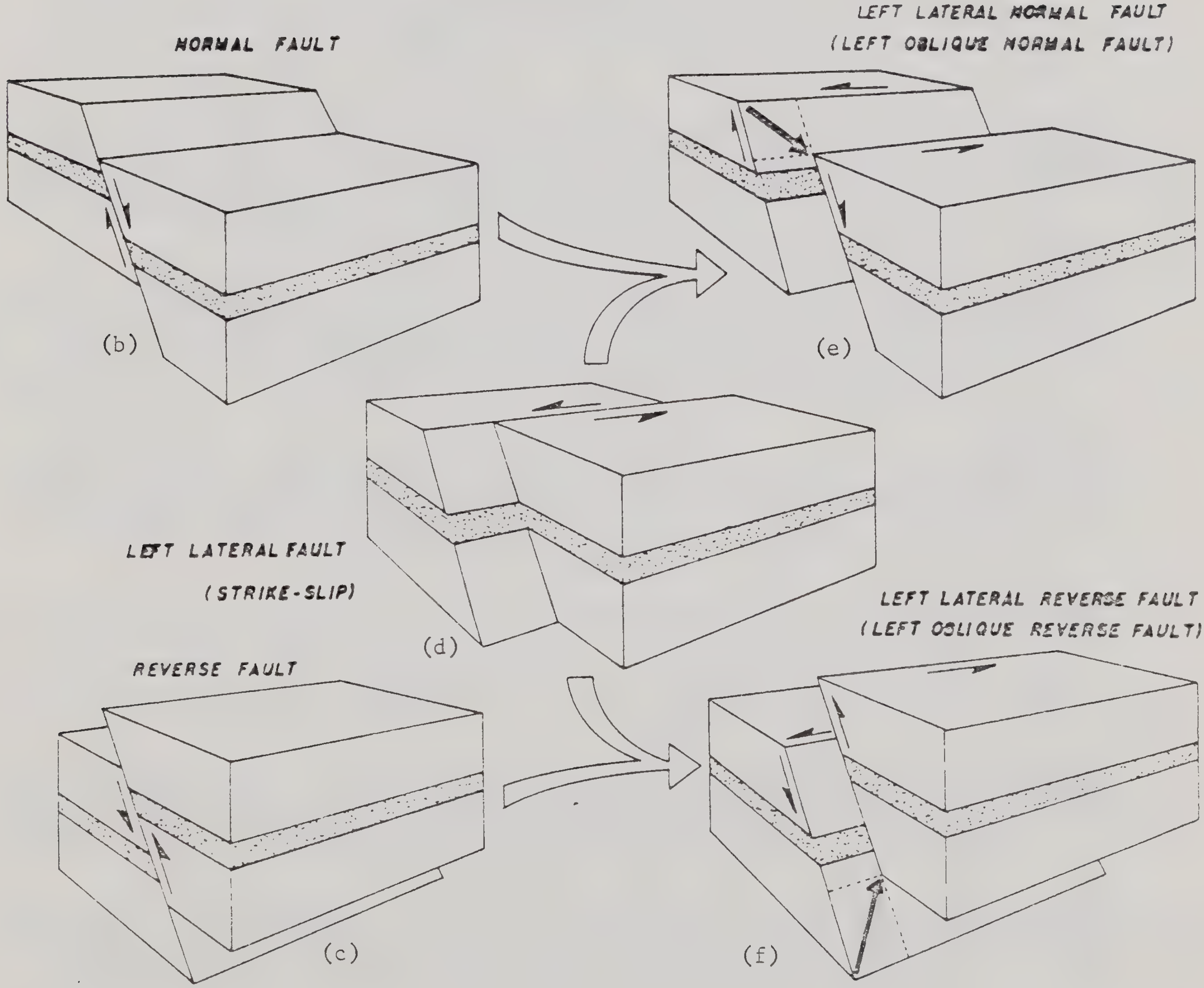
2. Dead load plus a single concentrated impact load covering 1 square foot of .75 times the fully loaded weight of the helicopter if it is equipped with hydraulic type shock absorbers, or 1.5 times the fully loaded weight of the helicopter if it is equipped with a rigid or skid type landing gear.

3. The dead load plus a uniform live load of 100 pounds per square foot. The required live load may be reduced in accordance with the formula in Section 2306.

6.3. Appendix C.

Types of Fault Movement





a) Names of some of the components of faults. b) Normal Fault, in which the hanging wall has moved down relative to the foot wall. c) Reverse Fault, sometimes called Thrust Fault, in which the hanging wall has moved up relative to the foot wall. d) Lateral Fault, sometimes called Strike-slip Fault, in which the rocks on either side of the fault have moved sideways past each other. It is called Left Lateral if the rocks on the other side of the fault have moved to the left, as observed while facing the fault and Right Lateral if the rocks on the other side of the fault have moved to the right, as observed while facing the fault. e) Left Lateral Normal Fault, sometimes called a Left Oblique Normal Fault. Movement of this type of fault is a combination of normal faulting and left lateral faulting. f) Left Lateral Reverse Fault, sometimes called a Left Oblique Reverse Fault. Movement of this type is a combination of Left Lateral Faulting and Reverse Faulting. Two types of faults not shown are similar to those shown in e and f. They are a Right Lateral Normal Fault and a Right Lateral Reverse Fault (a Right Oblique Normal Fault and a Right Oblique Reverse Fault, respectively).

6.4. Appendix D.

Beverly Hills Soil Types

The various types of soils found in Beverly Hills are plotted on Map 4. They include the following:

1. Altamont Loam (AL). This soil type goes to a depth of 8 to 12 inches and is light-brown to dark-brown in color. It is usually free of gravel, but it sometimes includes small quantities of shale fragments. The heavier-textured portions of the subsoil are compact and hard when dry and frequently crack upon exposure. Small concentrations of lime often occur in the subsoil.

2. Chino Clay Loam (Cc). Consisting of 12 to 18 inches of dark-grey to black, Chino clay loam is described as a rather friable, micaceous clay loam with a relatively high silt content. The subsoil has stratified layers of clay, silt, or fine sand; it is characterized as "poor draining," as it retains water. The soil is highly organic.

3. Dublin Clay (D). Dublin clay is a dark-grey to black rather friable, nonmicaceous clay soil seldom carrying gravel or other gritty material. It tends to crack and assume an adobe structure. It is sometimes calcareous and can contain small quantities of lime. The soil type is highly organic.

4. Hanford Loam (Hl). Hanford loam goes to a depth of between 12 to 72 inches and is brown or greyish-brown in color. It is friable and light textured. Some coarse, gritty material occurs in the surface soil near the foothills, and low strips of sandy loam and gravelly soil occur in places throughout. Hanford loam tends to be low in organic matter.

5. Hanford Sandy Loam (Hs). Hanford sandy loam consists of a brown or greyish-brown, friable, micaceous sandy loam, in places containing small quantities of gravel and gritty material, and generally uniform in texture to six feet. The organic-matter content varies considerably but tends to be low.

6. Holland Sandy Loam (Ha). Holland sandy loam goes to a depth of 10 to 18 inches and is brownish or greyish-brown in color. It is gritty, friable, and micaceous; and it is relatively low in organic matter. The soil tends to be droughty.

7. Pleasanton Loam (P). Light-brown to dark-brown in color, Pleasanton loam is a rather compact, medium-textured loam to silty loam generally 12 to 36 inches deep that in most cases contains small quantities of gravel and gritty material. (The quantities of gravel and gritty materials increases as the Santa Monica Mountains are approached.) It tends to have good drainage.

8. Ramona Clay Loam (Rc). Ramona clay loam goes to a depth of 8 to 24 inches and is brown, dark-brown, or greyish-brown in color. It is light textured and contains small quantities of mica, gravel, and gritty materials. Despite this, soil

texture varies from smooth to diverse. Water is slowly absorbed and tends to be heavy and compact. It contains small quantities of lime and is relatively high in organic matter.

9. Ramona Loam (Ro). Ramona loam subsurface soil consists of 12 to 24 inches of brown, greyish-brown or dark-brown, light-textured loam, containing small proportions of mica and gritty material. The subsoil is semi-cemented in places, closely approaching a hardpan.

10. Rough Broken Land (Rl). This type of land comprises areas unfit for use for agriculture because of their topography. The soil tends to be relatively free of rock outcrop and is covered with grass or dense growth of brush. Drainage tends to be excessive because of the steep slopes.

11. Yolo Clay Loam (Yo). Yolo clay loam extends to a depth of 1 to 6 feet and is brown, greyish-brown, or dark-brown in color. It is nonmicaceous and usually friable and free from gravel or coarse material. It is readily penetrated by roots and water; flooding has a tendency to pack and puddle the soil, greatly impairing its physical condition. Very organic in composition.

12. Yolo Loam (Y). Yolo loam, brown or greyish-brown in color, is a nonmicaceous loam containing small to medium gravel. The subsoil tends to be lighter in color; and the amount of gravel increases with proximity to the Santa Monica Mountains. It is very organic in composition.


MAP 4
SOILS MAP
DATE: April, 1975
Beverly Hills, Department of City Planning
Source: City of Beverly Hills
Public Works Department
Benedict Cañon
Coldwater Cañon
Assumed Hs
Al
P
Hs
Ha
Ro
Hl
Y
Yc
Rc
D
Sunset
Wilshire
Santa Monica
Olympic
Burton Way
Beverly
Doheny
Robertson
La Cienega
San Vicente
LEGEND
ALTAMONT LOAM AL
CHINO CLAY LOAM Cc
DUBLIN CLAY D
HANFORD LOAM Hl
HANFORD SANDY LOAM Hs
HOLLAND SANDY LOAM Ha
PLEASANTON LOAM P
RAMONA CLAY LOAM Rc
RAMONA LOAM Ro
ROUGH BROKEN LAND Rl
YOLO CLAY LOAM Yc
YOLO LOAM Y
SCALE IN FEET

6.5. <u>Comments Received on Draft Environmental Impact Report</u>: None.

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